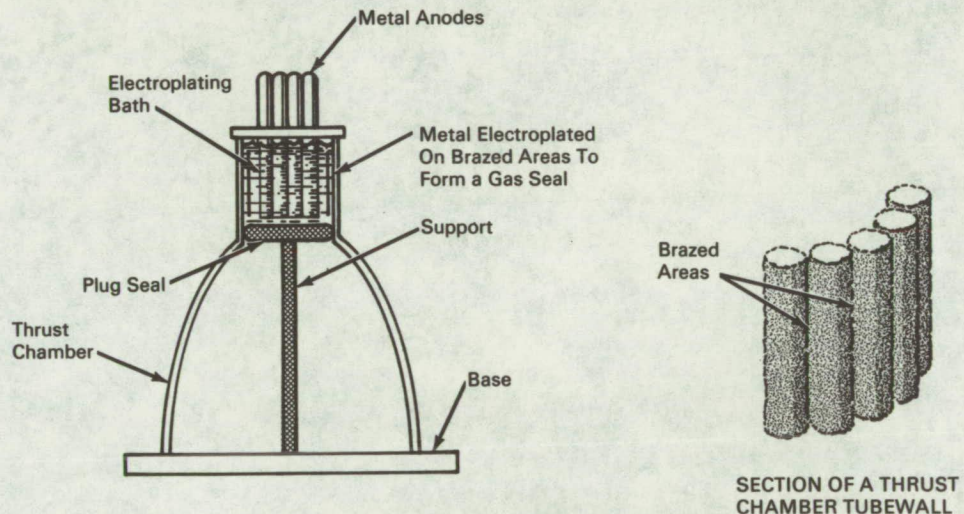


# NASA TECH BRIEF



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## Electroplating Eliminates Gas Leakage in Brazed Areas



### The problem:

To develop a method for sealing brazed or welded joints against gas leakage under high pressure. Large liquid fueled rocket engines are conventionally fabricated by brazing together lengths of metal tubing. During firing operations the thrust chamber is kept cool by fuel pumped through the tubes that form the wall structure. One serious drawback of this type of structure is gas leakage through minute holes in the brazed areas between the tubes which can occur during firing operations.

### The solution:

Electroplate the throat area of the thrust chamber to seal it against gas leakage.

### How it's done:

A liquid-tight plug is placed securely in the base of the throat of the thrust chamber, and the throat is then filled with an electroplating solution. A direct current is applied to the metal anodes and the metal tubewall structure serves as the cathode. Metal may be deposited to any required thickness on the brazed areas to form a seal against gas leakage. During firing operations, the brazed areas of the thrust chamber usually reach a temperature of 600°F to 800°F, which is well below the melting points of the electroplated seals.

### Notes:

1. Any of the following metal anodes can be used in this process: copper, nickel, chromium, tin, silver, and gold.

(continued overleaf)

2. Any conventional electroplating process can be used. A typical process for plating nickel would use nickel anodes to plate the brazed areas between the tubes of the thrust chamber. The electrolytic solution would consist of:

|                                      |                        |
|--------------------------------------|------------------------|
| NiSO <sub>4</sub> ·7H <sub>2</sub> O | 32 parts               |
| NiCl <sub>2</sub> ·6H <sub>2</sub> O | 2 parts                |
| H <sub>2</sub> BO <sub>3</sub>       | 4 parts                |
| pH                                   | 6±0.2                  |
| Bath Temperature                     | 125°F±5°               |
| Cathode current density              | 20 amp/ft <sup>2</sup> |

3. Areas of tubing can be sealed off with adhesive insulating tape or coating to limit the deposition of metal to the brazed areas. Several layers of different metals can be plated on the brazed areas and built up to any required thickness to form a seal.

4. This method can be used to seal welded seams on metal gas tanks and/or liners as well as joints in metal tubes and fittings.
5. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B66-10415

**Patent status:**

No patent action is contemplated by NASA.

Source: John D. Leigh  
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